IN THE CLAIMS:

1 1. (ORIGINAL) A system configured to allow an intermediate node to be gracefully re-

2 moved from service in a network, the system comprising:

3   a processing element of the intermediate node;

4   an operating system executed by the processing element to functionally organize

5 the intermediate node and invoke operations in support of a routing protocol executing on

6 the node; and

7   a Graceful Shutdown Notification message created by the processing element and

8 sent to routing protocol peers to announce an intention of the intermediate node to be

9 gracefully removed from service, the Graceful Shutdown Notification message further

10 indicating that the intermediate node is able to continue forwarding packets over the net-

11 work for a grace period, thereby allowing backup paths to be propagated to each peer and

12 put into service prior to a final withdrawal of routes advertised by the intermediate node.

1 2. (ORIGINAL) The system of Claim 1 wherein the Graceful Shutdown Notification

2 message comprises a Cease error code with one of an Administrative Graceful Shutdown

3 and Administrative Graceful Reset subcode.

1 3. (ORIGINAL) The system of Claim 2 wherein the Graceful Shutdown Notification

2 message further comprises a retention time value representing the grace period during

3 which the intermediate node maintains a forwarding state after sending the Graceful

4 Shutdown Notification message.

1 4. (CURRENTLY AMENDED) The system of Claim 4 1 wherein the routing protocol is

2 a Border Gateway Protocol (BGP).

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1   5. (CURRENTLY AMENDED) The system of Claim 5̶-4 wherein the intermediate node

2   is a BGP router.

1   6. (ORIGINAL) A method for allowing a router to be gracefully removed from service in

2   a network, the method comprising the steps of:

3   modifying a routing protocol executing on the router to enable the router to an-

4   nounce to its peers in the network its intention to be gracefully removed from service;

5   and

6   forwarding packets from the router over the network for a grace period, thereby

7   allowing backup paths to be propagated to each peer and put into service prior to a final

8   withdrawal of routes advertised by the router.

1   7. (ORIGINAL) The method of Claim 6 wherein the routing protocol is the Border

2   Gateway Protocol (BGP) and wherein the step of modifying comprises the step of insert-

3   ing one of an Administrative Graceful Router Shutdown and Administrative Graceful

4   Router Reset subcode into a BGP Graceful Shutdown Notification message with error

5   code Cease.

1   8. (ORIGINAL) The method of Claim 7 further comprising the step of setting a forward-

2   ing information base (FIB) retention time value in a data field of the message, the FIB

3   retention time value representing the grace period during which the router maintains its

4   forwarding state after sending the Graceful Shutdown Notification message.

1   9. (ORIGINAL) The method of Claim 8 further comprising the steps of:

2   sending the Graceful Shutdown Notification message from the router to its peers;

3   and

3

4   terminating all connections between the router and the peers, thereby implicitly

5   withdrawing from service, at the router, all original routes advertised on the terminated

6   connections.

1   10. (ORIGINAL) The method of Claim 9 further comprising the steps of:

2   receiving the Graceful Shutdown Notification message at the peers; and

3   retaining the withdrawn routes advertised on the terminated connections at the

4   peers until one of selection of another route as a best path and elapse of the grace period.

1   11. (ORIGINAL) The method of Claim 10 further comprising the step of, in response to

2   one of selection of the best path and elapse of the grace period, removing the retained

3   routes from service.

1   12. (ORIGINAL) The method of Claim 11 wherein the step of removing comprises the

2   step of removing the retained routes from a FIB of each peer.

1   13. (ORIGINAL) The method of Claim 11 further comprising the steps of, if a peer holds

2   a backup route for any of the withdrawn routes:

3   selecting the backup route as the best path; and

4   advertising the selected best path over the network.

1   14. (ORIGINAL) The method of Claim 10 further comprising the steps of:

2   marking the original routes as last resort routes; and

3   triggering the network to announce backup routes and re-converge without fully

4   withdrawing the original routes.

1   15. (ORIGINAL) Apparatus adapted to allow a router to be gracefully removed from ser-

2   vice in a network, the apparatus comprising:

3   means for modifying a routing protocol executing on the router to enable the

4   router to announce to its peers in the network its intention to be gracefully removed from

5   service; and

6   means for forwarding packets from the router over the network for a grace period,

7   thereby allowing backup paths to be propagated to each peer and put into service prior to

8   a final withdrawal of routes advertised by the router.

1   16. (ORIGINAL) The apparatus of Claim 15 wherein the routing protocol is the Border

2   Gateway Protocol (BGP) and wherein the means for modifying comprises means for in-

3   serting one of an Administrative Graceful Router Shutdown and Administrative Graceful

4   Router Reset subcode into a BGP Graceful Shutdown Notification message with error

5   code Cease.

1   17. (ORIGINAL) The apparatus of Claim 16 further comprising means for setting a for-

2   warding information base (FIB) retention time value in a data field of the message, the

3   FIB retention time value representing the grace period during which the router maintains

4   its forwarding state after sending the Graceful Shutdown Notification message.

1   18. (CURRENTLY AMENDED) A computer readable medium containing executable

2   program instructions <u>for execution on a router</u> for allowing a̶ <u>the</u> router to be gracefully

3   removed from service in a network, the executable program instructions comprising pro-

4   gram instructions for:

5   modifying a routing protocol executing on the router to enable the router to an-

6   nounce to its peers in the network its intention to be gracefully removed from service;

7   and

8   forwarding packets from the router over the network for a grace period, thereby

9   allowing backup paths to be propagated to each peer and put into service prior to a final

10   withdrawal of routes advertised by the router.

1   19. (ORIGINAL) The computer readable medium of Claim 18 wherein the routing proto-
2   col is the Border Gateway Protocol (BGP) and wherein the program instruction for modi-
3   fying comprises one or more program instructions for inserting one of an Administrative
4   Graceful Router Shutdown and Administrative Graceful Router Reset subcode into a
5   BGP Graceful Shutdown Notification message with error code Cease.

1   20. (ORIGINAL) The computer readable medium of Claim 19 further comprising one or
2   more program instructions for setting a forwarding information base (FIB) retention time
3   value in a data field of the message, the FIB retention time value representing the grace
4   period during which the router maintains its forwarding state after sending the Graceful
5   Shutdown Notification message.